IFPRI Discussion Paper 02059

November 2021

Have Households' Livelihoods and Food Security Rebounded from COVID-19 Shocks in Nigeria?

Results from a Follow-up Phone Survey

Bedru B. Balana

Motunrayo A. Oyeyemi

Adebayo I. Ogunniyi

Adetunji Fasoranti

Hyacinth Edeh

Kwaw S. Andam

Development Strategy and Governance Division

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

The International Food Policy Research Institute (IFPRI), a CGIAR Research Center established in 1975, provides research-based policy solutions to sustainably reduce poverty and end hunger and malnutrition. IFPRI's strategic research aims to foster a climate-resilient and sustainable food supply; promote healthy diets and nutrition for all; build inclusive and efficient markets, trade systems, and food industries; transform agricultural and rural economies; and strengthen institutions and governance. Gender is integrated in all the Institute's work. Partnerships, communications, capacity strengthening, and data and knowledge management are essential components to translate IFPRI's research from action to impact. The Institute's regional and country programs play a critical role in responding to demand for food policy research and in delivering holistic support for country-led development. IFPRI collaborates with partners around the world.

AUTHORS

Bedru Balana (b.balana@cgiar.org) is a Research Fellow in the Development Strategy and Governance Division of the International Food Policy Research Institute (IFPRI) Nigeria Office, Abuja, Nigeria.

Motunrayo A. Oyeyemi (m.a.oyeyemi@cgiar.org) is a Research Analyst in IFPRI's Development Strategy and Governance Division, Nigeria Office, Abuja, Nigeria.

Adebayo Ogunniyi (a.ogunniyi@cgiar.org) is a Research Analyst in IFPRI's Development Strategy and Governance Division, Nigeria Office, Abuja, Nigeria.

Adetunji Fasoranti (a.fasoranti@cgiar.org) is a Monitoring and Evaluation Officer in IFPRI's Development Strategy and Governance Division, Nigeria Office, Abuja, Nigeria.

Hyacinth Edeh (e.hyacinth@cgiar.org) is a Country Program Manager in IFPRI's Development Strategy and Governance Division, Nigeria Office, Abuja, Nigeria.

Kwaw Andam (k.andam@cgiar.org) is a Research Fellow and Program Leader in IFPRI's Development Strategy and Governance Division, Nigeria Office, Abuja, Nigeria.

Contents

TABLES

FIGURES

Abstract

The effect of the COVID-19 pandemic on households' income, jobs, and food security have continued despite perceptible reductions in transmission and lifting of restrictive policy measures in several countries. To assess these effects on Nigerian households, we collected household data in the initial three months after the outbreak of the pandemic (July 2020). To track the changes since the first survey, we conducted a follow-up phone survey with the same households a year later (July 2021). We undertook a comparative analysis between the two surveys focusing on key variables such as income loss, job loss, food security, and dietary diversity. The study also investigated how changes in income, wealth/endowments, social capital, safety net programs, and recurrent conflicts affected the severity of food insecurity amid the pandemic. We found that both income and jobs have rebounded significantly (by 50 percentage points) compared to the baseline results. In terms of food insecurity, households with "severely food insecure" situations dropped from 73 percent in the first survey to 65 percent in the follow-up survey. We also found a 5-percentage point improvement in the household dietary diversity scale in the follow-up survey. However, households reported an increase of more than 70 percent in conflicts or insecurity threats amid the pandemic. This affected farm investment decisions in 44 percent of smallholder farmers surveyed. While income loss significantly worsened households' food insecurity; livestock ownership and social capital cushioned households from falling into a more severe food insecurity situation. However, safety net programs provided by the government and NGOs did not significantly protect households from falling into severe food insecurity amid the pandemic. We suggest four policy propositions: prioritize investment in job creation to curb income loss; enable households to build their wealth base (e.g., land tenure security or livestock) to enhance resilience to shocks; revisit targeting approaches of safety net programs to enhance effectiveness of such programs; and finally, devise and implement conflict resolutions to induce investment and enhance productivity.

Keywords: COVID-19, Conflicts, Dietary diversity, Food insecurity, Livelihoods, Income loss, Households

Acknowledgments

The research output presented here forms part of the Feed the Future Nigeria Agriculture Policy Activity which is funded by the United States Agency for International Development (USAID). The research was also supported by the CGIAR Research Program on Policies, Institutions, and Markets (PIM), which is led by the International Food Policy Research Institute (IFPRI), and the CGIAR COVID-19 Hub. However, the opinions expressed here belong to the author(s) and do not necessarily reflect those of IFPRI, USAID, PIM, or CGIAR.

1. Introduction

The interruptions of general economic activities and within food supply chains, following the outbreak of the COVID-19 pandemic[1] have severely threatened the livelihoods and food security of households in developing nations like Nigeria (Laborde et al., 2020; Balana et al., 2020; Mahmud and Riley, 2021; Hirvonen et al., 2021; Amare et al., 2021). Studies published amid the pandemic have documented many of the dire effects of COVID-19 in developing countries, such as income losses (Dang and Nguyen, 2021; Mahmud and Riley, 2021); increases in food prices (Laborde et al., 2020); increased food insecurity (Ben-Hassen et al., 2020; Chenarides et al., 2021; Hirvonen et al., 2021; Amare et al., 2021); and hindering progress toward meeting the Sustainable Development Goal 2 of Zero Hunger (Otekunrin et al., 2020; Saccone, 2021). Households in developing countries like Nigeria with significant food insecurity and malnutrition problems prior to the onset of COVID-19 have seen those difficulties worsen under the pandemic.

The food insecurity that many Nigerian households face is situated within a context of serious socioeconomic challenges that include high rates of poverty, unemployment, and acute malnutrition, especially among vulnerable groups (Matthew et al., 2020; Andam et al., 2020; Okeke-Ihejirika et al., 2020). Forty-nine percent of Nigerians lived below the international poverty line of $1.90 per day before the pandemic (World Bank, 2018). Shortages of both energy- and nutrient-rich foods remain a major challenge. The stunting rate among children under five, a measure of chronic undernutrition, stands at 37 percent, among the highest in Africa south of the Sahara (Nigeria Demographic and Health Survey 2018; Government of Nigeria, 2020). Economic and social shocks induced by COVID-19 have exacerbated the vulnerability and food insecurity of Nigerian households. Moreover, beyond increasing economic volatility, the pandemic has heightened prevailing conflicts and insecurity threats, including increased insecurity in urban centers and greater inter-community conflicts in rural areas, such as between farmers and herders.

We conducted a phone survey in July 2020 to assess the effects of the pandemic on Nigerian households in the initial three months after the outbreak (from April to June 2020)[2] using a sample of 1,031 households in four Nigerian states. In the survey responses, about 88 percent of the households reported 50 percent income loss due to the pandemic; 66 percent reported reduced food consumption; and many households, especially poorer ones, indicated that COVID-19 significantly worsened their food insecurity (Balana et al., 2020). More than 80 percent of the respondents worried about not having enough food, and 77 percent ate less food than they thought they should. Survey households also reported a significant

[1] The presence of coronavirus in Nigeria was first reported on February 27, 2020. According to the Nigeria Centre for Disease Control (NCDC), 211,496 confirmed COVID-19 cases and 2,886 deaths were recorded until October 19, 2021 (NCDC Coronavirus COVID-19 Microsite).

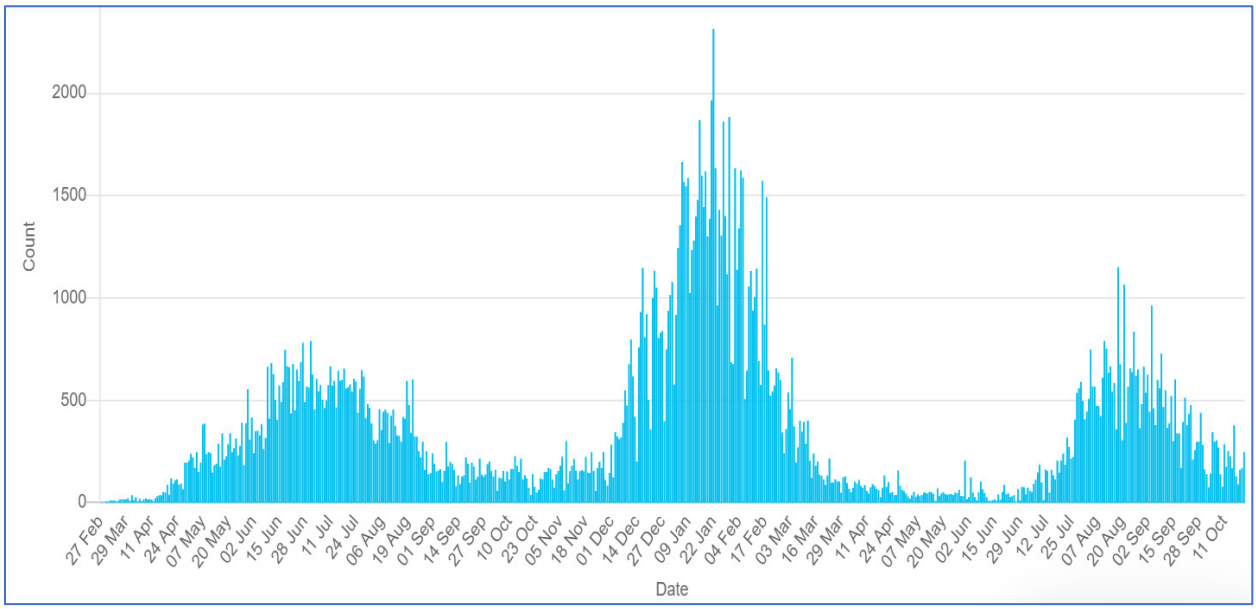
[2] The impacts of government policy responses to restrain the spread of COVID-19 were expected to be heightened over this initial period.

reduction in consumption of proteins (eggs, meat, and dairy products) and fruits since the pandemic struck. Increases in food prices were felt by most households (85 percent). Nonetheless, the severity of both the direct and indirect impacts of COVID-19 on livelihoods and food insecurity were found to be heterogeneous both spatially and across the population (Ayebare et al., 2020; Caggiano et al., 2020). Studies indicate that the poor and vulnerable households are the most affected (Andam et al, 2020; Obayelu et al., 2020).

Similar findings were reported in other studies conducted within the first three months of COVID-19 in Nigeria. Using pre-pandemic Nigeria General Household Survey data and follow-up National Longitudinal Phone Survey (NLPS) baseline data (April/May 2020) implemented by the World Bank and National Bureau of Statistics (NBS), Amare et al. (2020) assessed the impacts of the pandemic on food security, labor market participation, and local food prices in Nigeria. Their study shows that households exposed to higher numbers of COVID-19 cases or mobility restrictions experienced an increased level of food insecurity. Their findings indicate that the government's lockdown measures increased households' experience of food insecurity by 13 percentage points and reduced participation in nonfarm business activities by 11 percentage points. Similarly, using the NLPS baseline data, the World Bank and NBS (2020) show significant effects of the pandemic on the employment and income of households in Nigeria. Based on this study, 79 percent of survey households reported a decrease in their total income in the first three months following the outbreak of the pandemic. The study further shows that increases in prices of major food items were reported by 85 percent of the households surveyed and that the price shock seriously affected households' food consumption, with 51 percent of all surveyed households obliged to reduce food consumption as a coping mechanism.

Despite the rising cases of infections toward the last quarter of 2020 and the first quarter of 2021 (Figure 1), confronted with the simultaneous challenges of combatting the public health crisis of the pandemic and trying to recover a weakening economy, the government of Nigeria has gradually lifted restrictive lockdown and travel measures and decided to expedite vaccination efforts for as many Nigerians as possible, especially frontline workers.

Figure 1. COVID-19 cases in Nigeria (Feb. 2020 to Oct. 2021)



Source: Nigeria Centre for Disease Control (NCDC) (Web link - NCDC Coronavirus COVID-19 Microsite)

At the beginning of March 2021, the first shipment of 4 million Oxford–AstraZeneca COVID-19 vaccine doses from the COVAX initiative arrived in Nigeria, and vaccinations began three days later.[3] With the relaxation of lockdowns and other measures, as a response to restored normality, people working in the farm and nonfarm sectors gradually returned to business. However, loss of income and high inflation rates in the wake of COVID-19 and an economic recession in 2020 have continued to diminish the purchasing power of many households with negative implications for food consumption. The government and development partners adopted various safety nets through the Food Security Cluster (FSC) program. Thirty-seven organizations, including national and international NGOs and UN agencies, applied various transfer delivery mechanisms, such as cash in hand, mobile money transfers, paper vouchers, and electronic vouchers. In December 2020, the FSC assisted over 4 million individuals, 52 percent of whom received assistance through cash voucher assistance (CVA). Of those assisted with CVA, 56 percent received food assistance, while 44 percent received support under agriculture and livelihoods funding (Food Security Cluster, 2021)[4]. Yet, given the scale and magnitude of vulnerability of households to shocks, the food insecurity problems may likely remain in the months or years to come.

To assess the changes in the livelihoods and food security situation of households over the past year (since our first-round phone survey in July 2020), we interviewed the same households that participated in the

[3] However, according to the WHO, by October 18, 2021, only 2.6 percent and 1.3 percent of the population of Nigeria respectively had received their first doses and fully vaticinated. Nigeria: WHO Coronavirus Disease (COVID-19) Dashboard With Vaccination Data | WHO Coronavirus (COVID-19) Dashboard With Vaccination Data.

[4] https://fscluster.org/nigeria/document/food-security-sector-cash-dashboard-31

first-round survey in a follow-up phone survey in July 2021. Key questions on incomes, employment/labor movement, food security and nutrition, and coping strategies in the first-round survey were maintained in the follow-up survey. The follow-up survey included additional questions on conflicts, insecurity, shocks other than COVID-19, access to basic services (such as markets, credit, and clean water), COVID-19 testing, and vaccines. The results presented in this report are based on data obtained from the follow-up phone survey and some comparative analysis with the first-round survey data on key livelihood factors such as income, employment, and food security.

2. Methodology

2.1 Sampling and data collection

To track changes in the effects of the pandemic on households since the first-round survey (July 2020), we administered a follow-up phone survey with respondents who participated in the first survey sampled from four Nigerian states (Kebbi, Delta, Ebonyi, and Benue). Details of the sampling frame and selection of survey households were reported in Balana et al. (2020). About 82 percent of the original sample households (840 respondents of the 1,031 in the first-round) were recovered in our follow-up survey, meaning an 18.5 percent attrition rate. In addition to updating some of the questions from the first-round survey to accommodate the changes since then, the follow-up survey included new modules on conflicts, insecurity, shocks other than COVID-19, access to basic services (such as markets, credit, and clean water), and their perception of and access to COVID-19 testing and vaccines. The questionnaire was programmed in the SurveyCTO software in android tablets and administered to the respondents (mostly the household heads or spouses) through mobile phones at the household level. To monitor the adequacy of phone calls and data quality control, we used a phone call recorder to record the interviews.

To maintain consistency of the interview, enumerators who administered the first survey were hired for the follow-up survey. Though these enumerators have already acquired skills on phone survey, they were provided rigorous refresher trainings on phone interview facilitation skills, remote communication protocols, interpretation of the questionnaire in local languages, and handling of the SurveyCTO software (in data collection, storing, and uploading to the server). In addition to the enumerators, four field coordinators (one per state) who supervised the first survey were rehired to undertake advance calls to the sampled respondents, inform them about the study, and obtain initial consents. The enumerators administered the final phone survey in July/August 2021 to those respondents who consented in the advance calls. The data collected were exported from SurveyCTO software into STATA statistical software packages for cleaning and analysis.

2.2 Descriptive comparative analysis

To compare the changes on key outcome variables such as job loss, income loss, food security, and dietary diversity of households since the baseline survey (July 2020), we used basic comparative statistics such as comparison of means, variances, and frequency distributions of the data series in the two surveys. The results are presented using histograms, bar chats, pie charts, and tables**.**

2.3 Conceptual framework

We adopt a livelihood approach (DFID, 1999) for our analysis, focusing on four key livelihood enhancing variables—income, wealth endowments, social capital, and government/NGOs support programs—and how the changes in these variables during COVID-19 affected the severity of food insecurity and dietary diversity of households. Studies have shown that economic shocks in the context of *income decline* can adversely affect household food security, especially for the poor (Akter and Basher, 2014; Smith et al., 2018; Rufai et al., 2021). In contrast, increases in household incomes play a significant role in access to food, promoting both adequate consumption and dietary diversity (Deaton and Deaton, 2020; Manda et al., 2020). *Wealth endowments*, such as natural capital (land) and physical capital (livestock), can play an important role in determining households' food security and diet quality. Mulwa and Visser (2020) and Wodajo et al. (2020), for instance, both found that livestock ownership plays an important role in ensuring household food security, either through own consumption or through sales of livestock for cash during periods when the household has limited income.

While food security in developing countries often depends on a household's ability to produce its own food combined with its capacity to purchase foods, the strength of a household's *social capital*—its bonds with the rest of the community (e.g., family, relatives, and friends)—significantly helps it minimize the severity of food insecurity, especially in times of shock (Mbugua and Nzuma, 2020). However, considering the nature of the indiscriminate shocks imposed by COVID-19, which are likely to affect every household in a community, the potential of social capital to serve as a buffer for other households may be undermined. The support mechanisms offered to vulnerable households by the government and NGOs through *social safety nets* programs may also play an important role in minimizing the negative consequence of COVID-19. Studies have shown that interventions from both the government and NGOs during shocks, like that of COVID-19, have reduced the severity of food insecurity (Devereux et al., 2020; Headey et al., 2020; Laborde et al., 2020). Devereux (2016) noted that food insecurity can be addressed most directly by giving food insecure people food (food aid) or the means to access food (conditional or unconditional cash transfers).

Conflicts and the insecurity threats amid the pandemic exacerbate the food insecurity of households directly by disrupting food supply chains or indirectly by affecting livelihood activities. Review of available

literature show that insecurity threats and conflicts, such as the Boko Haram[5] terrorist attacks in northeast Nigeria, reduce area cultivated, agricultural output and productivity, and investments (Kimenyi et al., 2014; Adelaja and George, 2019; Mitchell, 2019). Conflicts also reduce farmers' cattle holdings by increasing cattle thefts and losses and reducing cattle purchases (George et al., 2021). The Boko Haram terrorist insurgencies in the northeast, pastoralist attacks in the central belt and southeast of the country, and banditry are major threats affecting livelihoods, agriculture, and food security in recent years.

2.4 Construction of food insecurity and dietary diversity indicators

Food insecurity indicators were constructed from survey data using the eight standard experience-based food insecurity experience scale (FIES) questions (FAO, 2016) as described in appendix Table A1. This metric has been widely used in the analysis of food insecurity (Cafiero, et al., 2018; FAO, 2016). Based on the individual's "yes/no" responses to the eight FIES questions and adapting the FAO's global reference scale of FIES (FAO, 2016), the household's food insecurity condition was grouped into four ranked categories:

1) *Food secure* (=1): If the household responded 'no' to all the eight questions, i.e., if $Q_1=Q_2=Q_3=Q_4=Q_5=Q_6=Q_7=Q_8=0$
2) *Mildly food insecure* (=2): If the household respond 'yes' to at least one of the first three FIES questions (i.e., if $Q_1=1$ or $Q_2=1$ or $Q_3=1$) and zeros to the rest of the FIES questions i.e., $Q_4=Q_5=Q_6=Q_7=Q_8=0$
3) *Moderately food insecure* (=3): If the household responded 'yes' to either Q_4 or Q_5 and zeros to Q_6, Q_7, and Q_8
4) *Severely food insecure* (=4): If the household responded 'yes' to one or more of the last three FIES questions i.e., $Q_6=1$ or $Q_7=1$ or $Q_8=1$

Dietary diversity is measured by the number of different food groups from which food was consumed by a household over the given reference period. We constructed a household dietary diversity indicator using the 'yes/no' responses to the 11 household dietary diversity score (HDDS) questions presented in appendix Table A2. Following Vhurumuku (2014), we constructed the HDDS as follows: (1) re-group the 12 food groups into 7 food groups (appendix Table A2); (2) create a binary response (1=yes) if the household consumed any food from the specific food group during the reference period; (3) sum horizontally the binomial variables to generate a count value; and (4) the new variable, the HDDS, ranges from a minimum of 0 to a maximum of 7.

[5] "Boko Haram" means "Western education is forbidden" in Hausa language. The group officially calls itself "Jama'atul Alhul Sunnah Lidda'wati wal Jihad," which means "people committed to the propagation of the Prophet's teachings and jihad."

2.5 Other variables

COVID-19 testing and vaccination – two dummy variables on households' behavior related to the coronavirus testing and vaccination are constructed: (1) household where any member got tested for coronavirus (yes/no) and (2) household where any member got vaccinated for COVID-19.

Independent variables – Table 1 (section 3) presents the list of independent variables used in the econometric models. As highlighted in the conceptual framework (section 2.3), our focus is on the *livelihood indicators* (income loss and job loss); *asset and wealth indicators* (land size and livestock numbers); *social capital indicators* (support from friends and family members); *external intervention indicators* (support from government and NGOs); and the effect of conflicts/insecurity threats though control variables (demographic characteristics, geographic factors, and information access) were included in the models.

2.6 Analytical models

2.6.1 Logit model

In many developing countries like Nigeria, either due to lack of access to testing facilities or due to cultural constraints or religious beliefs, a significant proportion of the population are reluctant to undertake COVID-19 tests. More importantly, high resistance to COVID-19 vaccines has been observed in many developing countries. To shed a light on key factors behind the factors driving such behavior, a basic binary outcome model (Cameron and Trivedi, 2010; Wooldridge, 2010) is used to predict the probability of individual's COVID-19 testing and vaccination decision. Assuming the logistic distribution of the error terms, we applied the logit probability models.

2.6.2. Ordered logit model

The household's FIES indicator variable as defined in section 2.4 is an ordered outcome with four categories: 1=Food secure, 2=Mildly food insecure, 3=Moderately food insecure, and 4=Severely food insecure. We use an ordered logit model to examine the factors conditioning the FIES situation of a household amid the COVID-19 pandemic in Nigeria. We let the categorical variable y_i take values $j = 1, 2, 3, 4$ that represents the household's FIES category. Defining y_i^* as the latent unobserved measure of the i^{th} household FIES status that progressively crosses high thresholds, we specify an index model for y_i^* as in equation 1 (Cameron and Trivedi, 2010):

$$y_i^* = x_i'\beta + u_i \quad \text{.....(1)}$$

Where the x_i' is a vector of regressors, β is equal to the parameters to be estimated and u_i is an error term. From equation 1, higher values of y_i^* indicate the more severe food insecurity situation of the household. For an m–categorical ordered logit model, we define a household's FIES category j as in equation 2:

$$y_i = \text{j if } \alpha_{j-1} < y_i^* \leq \alpha_j, \text{ for } j = 1, \ldots, m \quad \text{.....(2)}$$

Where α_j indicates threshold values for the j^{th} FIES category. The probability that the i^{th} household falls in the j food insecurity category (P_{ij}) can be presented as in equation 3:

$$P_{ij} = P(y_i = j) = P\left(\alpha_{j-1} < y_i^* \leq \alpha_j\right) = \mathrm{F}(\alpha_j - x_i'\beta) - \mathrm{F}(\alpha_{j-1} - x_i'\beta) \ldots\ldots\ldots (3)$$

The marginal effects on the probability of being in food insecurity category j by the i^{th} household when the regressor x_r changes is given by the partial derivative of equation 3 with respect to x_r multiplied by the estimated slope coefficient of x_r, i.e., β_r (equation 4) (Cameron and Trivedi, 2010; Wooldridge, 2010).

$$\frac{\partial P(y_i=j)}{\partial\, x_r} = [F'(\alpha_j - x_i'\beta) - F'(\alpha_{j-1} - x_i'\beta)]\,\beta_r \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

where $F(.)$ is the cumulative distribution function (cdf) of u_i and $F'(.)$ is the partial derivatives with respect to the regression covariates. It is assumed that u_i has a logistic cumulative distribution function with $F(z) = e^z/1 + e^z$. The parameters β and the $m-1$ threshold parameters, α_1, $\alpha_{2,\ldots,\alpha_{m-1}}$ are estimated by maximizing the log likelihood of equation 3 using the maximum likelihood estimator.

3. Descriptive results

This section provides descriptive findings on the effects of the COVID-19 pandemic on various dimensions of livelihoods and food security indicators. Exploiting the two rounds of data, we focus on changes in the effects of the pandemic on household incomes, employment, food security, and dietary diversity since the baseline survey in July 2020. Table 1 presents summary statistics from the two surveys grouped under *livelihoods variables, demographic/geographic, human/social capital, assets/wealth indicators, access variables,* and *COVID-19 testing and vaccination*. As shown in Table 1, household income loss has reduced from an average income loss of 43.4 percent in the baseline to percent 22 percent in the follow-up survey later a year (i.e., a reduction in income loss by 50 percentage points between the two surveys). This is a significant rebound in household income. A similar trend is observed in employment; 42 percent of the respondents reported job loss in the first survey against 21 percent in the follow-up survey. While social support mechanisms increased significantly (19 percent and 39 percent of respondents received support from family and friends in the first and follow-up survey, respectively), support from the government and NGOs shows a reduction of about 3 percentage points (from 12.3 percent to 9.4 percent).

Results further indicate a marginal occupational shift from farming to nonfarm activities. In the first-round survey, approximately 68 percent of the respondents were engaged in farming or farm-related activities as their primary occupation, while this figure drops to 62 percent in a follow-up survey. Some of the key coping strategies pursued in responses to the COVID-19 shocks (job and income losses) included livelihood diversification through engagement in nonfarm activities, seasonal migration, and sales of assets and livestock. Our results are consistent with findings from past studies in developing countries where smallholder farmers adopt a range of coping strategies to mitigate the effects of external shocks such as

climate risks (Barrett and Carter, 2013; Mitter, et al., 2015, Martin and Lorenzen, 2016; Asfaw et al., 2018). Note that COVID-19 testing and vaccination related questions were not asked in the first-round survey.

Table 1. Descriptive summary statistics of key variables

Variables	Round-I (July 2020)		Round-II (July 2021)	
	Mean	Std.	Mean	Std.
Livelihood variables				
HH income loss amid C-19 (%)	**43.390**	27.283	**22.00**	25.20
HH member lost job (0/1)	**0.419**	0.493	**0.213**	0.410
HH livelihood on-farm (0/1)	**0.680**	0.470	**0.621**	0.490
Demographic and geographic variables				
HH in rural area (0/1)	0.724	0.446	0.702	0.457
Location north state (0/1)	0.258	0.437	0.273	0.445
HH head male (0/1)	0.600	0.491	0.614	0.487
HH head age (years)	40.00	11.45	41.06	11.14
HH head married (0/1)	0.77		0.83	0.370
Household size (#)	7.38	5.09	7.92	4.00
Human and social capital variables				
Education secondary (0/1)	0.251	0.460	0.290	0.454
Education above secondary (0/1)	0.552	0.494	0.613	0.487
Received family/friends support (0/1)	**0.190**	0.292	**0.393**	0.488
HH member migrated amid C-19 (0/1)	0.096	0.294	0.234	0.423
HH member of local association (0/1)	n.a.	n.a.	0.55	0.498
HH assets/wealth indicators/external support				
HH own agricultural land (0/1)	0.876	0.328	0.795	0.403
Land size owned (ha)	3.373	6.829	2.830	3.83
Livestock size owned (TLU)	2.283	6.298	2.754	8.125
Received government/NGO support (0/1)	**0.123**	0.328	**0.094**	0.292
HH exposed to insecurity (0/1)	n.a.	n.a.	0.500	0.500
Access related variables				
Access to all weather roads (0/1)	n.a.	n.a.	0.699	0.459
Access to C-19 related info (0/1)	0.922	0.267	0.681	0.466
Access to health services (0/1)	n.a.	n.a.	0.869	0.338
Access to C-19 protective measures (0/1)	n.a.	n.a.	0.857	0.35
C-19 testing and vaccination				
HH member got tested (0/1)	n.a.	n.a.	0.239	0.427
HH willing to get tested if free (0/1)	n.a.	n.a.	0.740	0.439
HH member got vaccinated (0/1)	n.a.	n.a.	0.236	0.425
HH willing to get vaccinated if free (0/1)	n.a.	n.a.	0.236	0.425

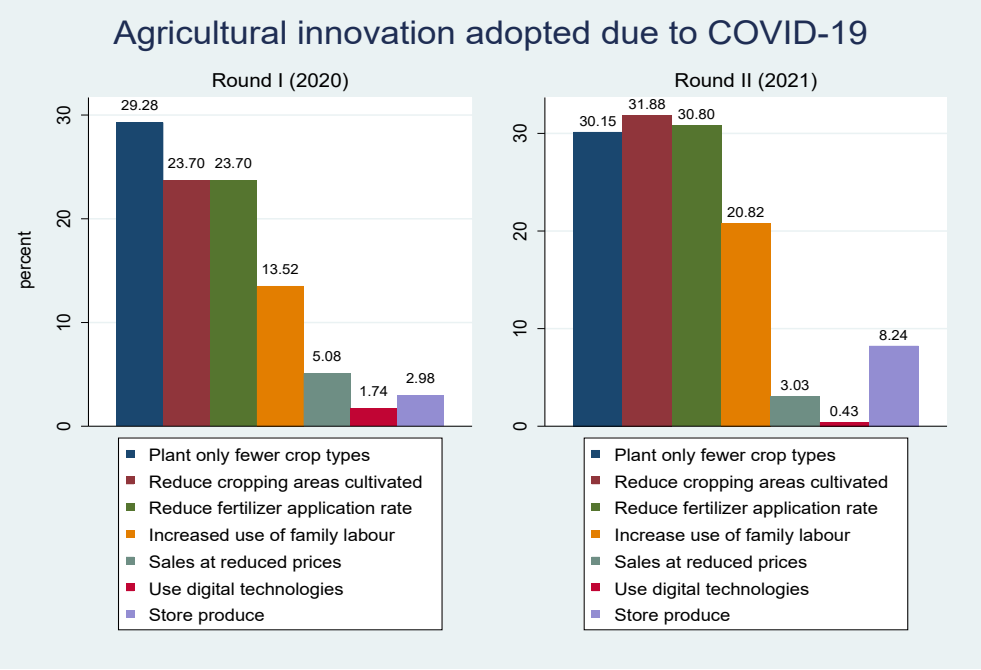
Source: Authors' construction

Note: HH= Household; (0/1)= no/yes dummy responses (0=no, yes=1); ha= hectare; TLU=Tropical livestock unit; Std= standard deviation; n.a.= Not asked in follow-up survey/not applicable. #=numbers (count); C-19= COVID-19.

3.1 Agricultural activities (crops and livestock)

To assess whether the COVID-19 pandemic has triggered changes or innovative practices in farming, nonfarm production, business operations, input usages, or postharvest management, we asked respondents whether "*they had adopted any innovations or changes in their farming and business operations or changed the crop types they grow because of the COVID-19 pandemic*" since the baseline survey in July 2020. The responses show that 55 percent of crop farmers adopted changes in their farming, such as planting fewer crops and reducing cropping areas. Comparing the changes or adoption of innovative practices in response to the pandemic in the baseline survey (July 2020) with the follow-up survey (July 2021), we observe an increase in the number of farmers who modified their farming practices (Figure 2). This seems intuitive because, at the time of the baseline survey, farmers had not had sufficient time to adjust their practices to respond to the changing environment. As shown in Figure 2, a reduction in cropping areas is the change most adopted by farmers (32 percent) followed by reducing fertilization application (31 percent), planting fewer crops (30 percent), and shifting from hired labor to family labor (21 percent). The use of digital technologies such as phones and the internet to arrange pick-ups of farm produce remain widely underutilized. Instead, farmers kept farm produce in stores or increased their stocks, perhaps in anticipation of future price changes. Studies elsewhere document similar findings on the effects of COVID-19 on agriculture and food supply chains in terms of disrupting the agricultural inputs supply chain, reducing areas cultivated, and constraining transport of goods to processing facilities and/or markets (FAO, 2020; Wei and Lu, 2020).

Figure 2.Changes or adoption of innovation in farming amid COVID-19



Source: Authors' compilation from the second-round phone survey data (July 2021).

3.2 Income loss and coping strategies

To capture income loss amid COVID-19, respondents in both survey rounds were asked a "yes/no" question: "*Have you or any member of your household experienced income loss due to the coronavirus?*" Respondents who answered "yes" were asked a follow-up question: "*In your estimate, how much income (in percentage) did your household lose compared to the income level your household normally earns in this time of the year?*" Whereas 88 percent of the households reported up to 50 percent income loss in the baseline survey (July 2020), 62 percent of survey households reported about 35 percent income loss in the follow-up survey. This shows that the share of households reporting income loss as well as the magnitude of income loss are lower in the second survey compared to the baseline survey. This may imply a gradual recovery and rebound of livelihoods from the shock. Besides income loss, households also experienced multiple shocks amid the COVID-19 pandemic. Table 2 reports the various shocks households experienced, with increased food prices being the most common shock, encountered by 90 percent of the survey households. Furthermore, 66 percent the respondents associated food price inflation with COVID-19 shocks due to either reduced production or disruptions in supply chains. Job loss was reported by 21 percent of survey households; however, it is noted that not all job losses were because of the pandemic, yet most respondents (72 percent) associated job losses with COVID-19.

Table 2. Shocks experienced by households

Types of shock	Has the household experienced the shock? (Yes, %)	Do you believe this shock was caused by the coronavirus? (Yes, %)
Job loss	21	72
Nonfarm business closure	26	80
Theft/looting of cash or property	23	40
Disruption of farming, livestock, fishing activities	33	29
Increase in price of major food items consumed	90	66
Illness/injury/death of income earning household member	39	11
Kidnapping/hijacking/robbery/assault	9	31
Poor rains that caused harvest failure	33	8
Flooding that caused harvest failure	28	9
Pest invasion that caused harvest failure or storage loss	28	8

Source: Authors' compilation from the second-round phone survey data (July 2021).

The survey further explored key coping strategies households adopted in response to the COVID-19 related or other types of shocks. Food price inflation is the most prevalent shock, faced by 90 percent of households (Table 2). As shown in appendix Table A3, reducing consumption, depleting savings, reducing nonfood consumption, selling assets, and engaging in additional income-generating activities are the top five coping strategies adopted by the majority of households to cope with food price inflation. Unfortunately, nearly

50 percent of the households reported having reduced their food consumption, 36 percent depleted their existing savings, and 34 percent reduced nonfood consumption as a coping strategy to price inflation. Such negative coping strategies could lead to severe food insecurity and overall degradation of well-being. On the other hand, coping strategies such as livelihood diversification, e.g., income from nonfarm sources, provide households with better options to adapt to shocks. As shown in appendix Table A4, our survey households were receiving income from nonfarm income sources. This implies the practice of livelihood diversification to enhance resilience in the event of shocks. For instance, among the respondents in the follow-up survey, about 77 percent received income from nonfarm family businesses, 46 percent from wage employment, and 38 percent received assistance from family/friends. However, the significance of these non-income sources in ameliorating the risk of shocks such as the COVID-19 pandemic depends on the size and frequency of the income flow (Phillipson et al., 2020).

Generally, food price volatility (both increases and decreases) has been observed amid COVID-19 in different regions of the world, and this has differential impacts on rural and urban residents (FAO, 2020). For example, in Bangladesh, significant price reduction was observed at the farmgate for perishable food products, while prices of staple food commodities rose by as much as 25 percent in large urban markets (FAO, 2020). In Nigeria, food prices continued to rise in 2020, and in March 2021 food inflation of basic food commodities hit 22.95 percent, the highest in the past two years (NBS, 2021). However, since then there has been a gradual decrease in this consumer price index to 20.3 percent in August 2021 (NBS, 2021).

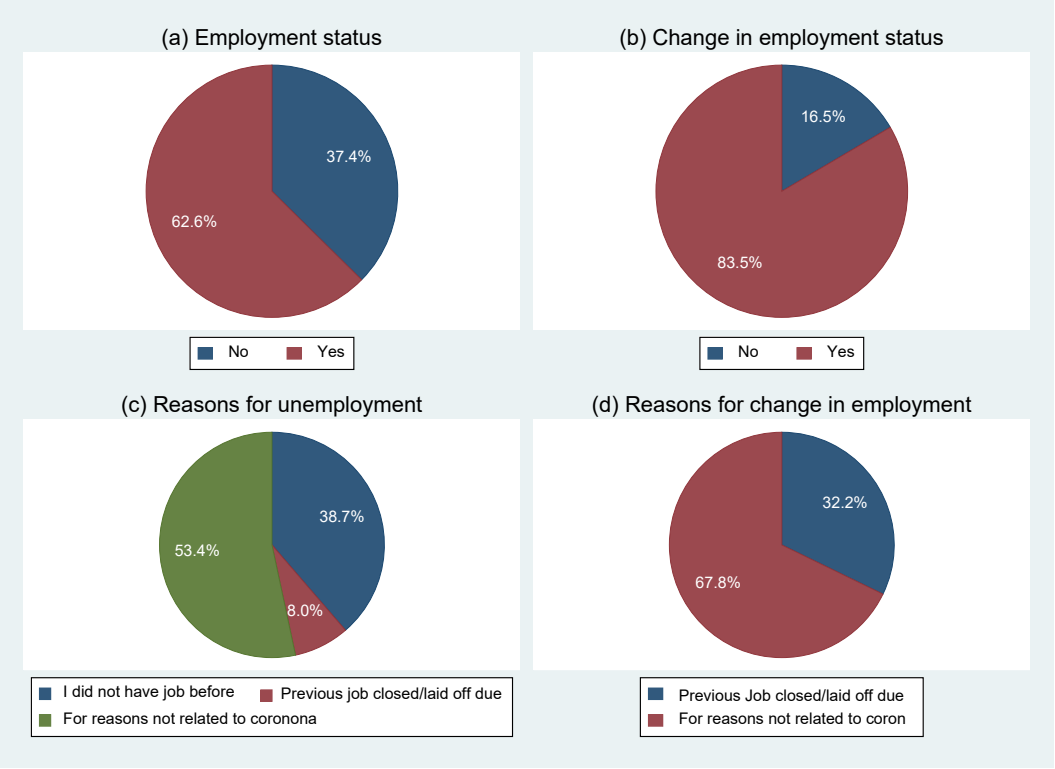
3.3 Employment and labor movement

Job losses have been reported globally due to the COVID-19 pandemic. Lower-paying occupations and hospitality sectors are disproportionally affected by the pandemic (Cortes and Forsythe, 2020). In Nigeria, though restrictions were not imposed directly on farming activities, employment in the agricultural sector was impacted indirectly through disruptions of the food supply chains and nonfarm livelihood activities (Andam et al., 2020). To assess the effects of the pandemic on employment among Nigerian households and the dynamics of employment changes since the first-round survey (July 2020), respondents in the follow-up survey (July 2021) were asked a series of employment related questions—*whether they engaged in any gainful economic activity (yes/no); whether anyone in the household lost a job amid the COVID-19 pandemic (yes/no); whether the job loss was due to COVID-19 or for reasons not related to the pandemic;* and *whether household members changed jobs amid the COVID-19.* The pie-charts in Figure 3 depict summary results based on the responses. Results indicate that about 37 percent of the respondents were unemployed at the time of the survey (Figure 3(a)), 16 percent had changed their employment[6] (Figure 3(b)), and 32 percent were re-employed after being laid-off due to COVID-19 (Figure 3(d)). But the

[6] But most of these job changes (68 percent) are for reasons not related to COVID-19.

overwhelming majority of the unemployed did not have a job in the first place or were casual farm or nonfarm workers who recently lost their jobs for reasons not related to COVID-19. Thus, the unemployment problem appears to be an existing structural problem, though the economic disruptions caused by the COVID-19 played a part.

Figure 3. The effects of COVID-19 on labor employment



Source: Authors' compilation from the second-round phone survey data (July 2021).

3.4 Food security and dietary diversity

We used an experience-based scale, i.e., food insecurity experience scale (FIES), and household dietary diversity score (HDDS) to assess the effects of COVID-19 on food security. As discussed in section 2.4, the eight experience-based food insecurity questions (FAO, 2016) were used to construct FIES. Since the FAO's Voices of the Hungry project (FAO, 2016), the FIES has been widely used as a new metric for food insecurity at different scales (from individual and households to international cross-country comparisons) (Cafiero et al., 2018). Based on the individual's "yes/no" responses to the eight FIES questions and adapting the FAO's global reference scale of FIES (FAO, 2016), the household's food insecurity condition in the 12 months since the first-round phone survey (July 2020 to June 2021) was categorized into four ordered categories (1=food secure; 2=mildly for insecure; 3=moderately food insecure; and 4=severely food insecure) (see section 2.4). Table 3 presents a comparative summary of the distributions of the four categories of FIES measured three months before COVID-19, in the initial three months of COVID-19, and a year later in the follow-up survey (July 2021).

Table 3. Distribution of households across the FIES categories (pre-COVID 19, initial 3 months of COVID-19, and a year after the first survey)

FIES-based categories of food insecurity	3 months before C-19		Initial 3 months of C-19		Survey-II	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Food secure	588	57.0	71	6.9	115	13
Mildly food insecure	170	16.5	82	7.9	77	9
Moderately insecure	79	7.7	130	12.6	104	12
Severely food insecure	194	18.8	748	72.6	544	65

Source: Authors' compilation from phone survey-I data in July 2020 (n=1,031) and a follow up survey in July 2021 (n=840).
Note: C-19= COVID-19.

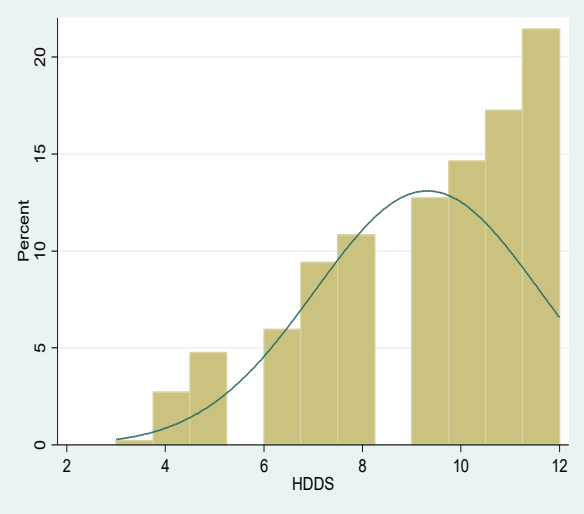
As shown in Table 3, there is a slight increase in *food secure* households (from 7 to 13 percent) in the follow-up survey and a 1 percentage point–increase in *mildly food insecure* households (from 8 to 9 percent). Households in the *moderately food insecure* group remain almost the same, but the *severely food insecure* households dropped from 73 percent at the baseline survey to 65 percent in the follow-up survey (a drop of 8 percentage points). This indicates positive transitions of households from more severe food insecurity to less severe food insecurity situations. This may be partly attributed to the opening-up of economic activities and easing of COVID-19 restrictions over time. In the survey, we also attempted to disaggregate whether it was COVID-19 or factors not related to the pandemic that triggered a "yes" response to each of the eight FIES questions. The summary statistics are presented in appendix Table A1. For instance, for the first FIES question – "were you or others in your household *worried that you would not have enough food to eat* because of lack money or resources?" – 76.7 percent responded "yes," of which 69.6 percent reported that the COVID-19 pandemic was to blame for this specific food insecurity situation experienced by the household.

In terms of dietary diversity, we computed the household dietary diversity score (HDDS) using a 7-day consumption recall of 12 food groups (Vhurumuku, 2014). Table 4 shows that over 93 percent of the households consumed cereals, oils, and vegetables. Past studies (Ogechi and Chilezie, 2017; Onyeji and Sanusi, 2017) similarly report that cereals, oils, and vegetables are commonly consumed foods in Nigerian diets. On the other hand, we observe low consumption of dairy products and eggs, implying shortages of protein-rich food in households' diet composition. This may be partly associated to the relatively high prices of animal-source foods compared to cereals or vegetables.

Table 4. Distribution of food groups consumed by the households

Food group	'Yes' responses (%)
Cereals	93.21
Tubers	79.40
Legumes	71.79
Dairy	49.52
Meat	73.45
Eggs	46.79
Fish	82.98
Oils	98.81
Vegetables	98.81
Fruits	65.12
Sugar	74.29
Condiments	97.62

Figure 4. The distribution of household dietary diversity during the pandemic (bins are percent of respondents and the line graph is a quadratic fit)



Source: Authors' compilation from the second-round phone survey data (July 2021). Note: HDDS = Household Dietary Diversity Score

A household earns a score of 1 if it consumed a particular food group and a 0 score if it did not. Figure 4 illustrates the diversity of food consumed at the household level. We found that more than 75 percent of households have a diversity score of above 6, of which 21 percent have a 12-out-of-12 diversity score. Comparison of these results with the findings in survey data a year ago (70 percent had above 6 scores, of which 16 percent had 12-out-of-12 scores), demonstrates a 5-percentage points improvement in the HDDS in the follow-up survey.

3.5 COVID-19 testing and vaccination

When the baseline survey was conducted (July 2020), COVID-19 testing was not widely available in Nigeria and a vaccine was not yet developed. In the follow-up survey a year later, we included new questions on households' perception and experience related to testing, vaccination, virus contraction, and recovery rates. Table 5 reports the perception and experience of households on COVID-19 testing, virus contraction, and vaccination. As shown in Table 5, 24 percent of survey households underwent COVID-19 testing. Of these, the overwhelming majority (88 percent) were tested at government facilities for free and only 5 percent paid for tests at private health centers. Testing is often carried out when a person is sick and suspected to be infected with the virus. The government provides a cost-free testing facility for the population, but there may be a gap in information regarding the free facilities among the public, which allowed private health providers the opportunity to charge for these services.

Table 5. Respondent's perception and experience in COVID-19 testing and vaccination

Questions	Yes (%)	No (%)	Not sure (%)
Testing and contraction of coronavirus			
- Have you or any member of your household taken the coronavirus test?[1]	23.93	76.07	n.a.
- Has anyone in your household contracted the coronavirus?	2.02	97.98	n.a.
- Are you worried about the possibility of contracting coronavirus (yourself or any household member)?	40	27.38	32.62
- Has the person who contracted the virus recovered from the disease?	82.35	17.65	n.a.
Vaccination related questions			
- Have you or any member of your household been vaccinated for coronavirus?	23.57	76.43	n.a.
- If an approved vaccine to prevent coronavirus was available right now at no cost, would you agree to be vaccinated?	63.95	21.55	14.52

Source: Authors' compilation from the second-round phone survey data (July 2021).

Note: 'Yes' respondents were asked a follow-up question: "*How did you access the testing service*?" Distribution of responses: Government for free (88.56 percent), government but paid (5.97 percent), and private service and paid (5.47 percent). n.a.= not applicable

Regarding coronavirus contraction, only 2 percent reported that they had contracted the virus, 82 percent of whom were fully recovered. The low coronavirus contraction rate and high recovery rate in this survey are consistent with the trend of the disease in Nigeria. According to the WHO on October 20, 2021, the number of confirmed COVID-19 cases in Nigeria was 209,546 (approximately 0.1 percent of the population (https://covid19.who.int/region/afro/country/ng). This shows that Nigeria can be clustered among the countries with low infection rates, though infections among some segments of the population might have been undetected due to limited testing coverage, particularly in rural areas.

We observe that though 72 percent of survey respondents had varying degrees of concern regarding the possibility of contracting the disease, only 24 percent decided to be vaccinated. Nevertheless, when we inquired about their willingness to receive the vaccine at no cost, 64 percent said they were willing to take the vaccine. This presents an opportunity for the government to fill this demand for the vaccine. The contrasting results between the low vaccination rate and the willingness to get vaccinated demonstrates either a gap in information, inaccessibility of the vaccine, or some other limitations influencing the adoption of the vaccine, for instance, a response bias (social desirability bias) where respondents feel they have to say that they would be willing to be vaccinated but they actually would not if given the opportunity to do so.

4. COVID-19, conflicts/insecurity, and farming activities

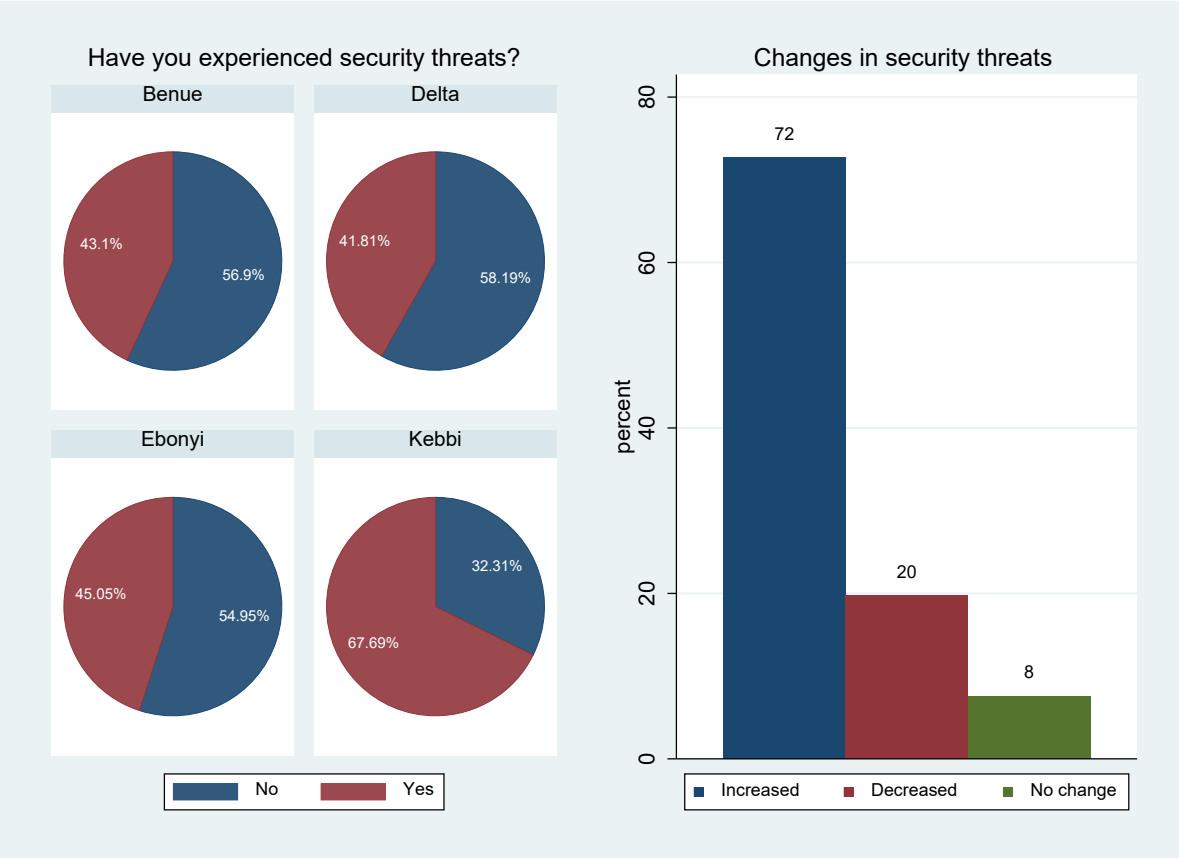
Presently, amid the COVID-19 induced economic disruptions, the risks imposed by armed conflicts and general security threats including kidnapping, banditry, the Boko Haram insurgency, and farmer–herder conflicts are becoming major concerns in Nigeria, affecting the livelihoods of households, agricultural investment, production, productivity, food security, and nutrition. Recent studies on the impacts of insecurity in Nigeria's agriculture sector and elsewhere in Africa south of the Sahara show that conflicts and terrorist attacks reduce area cultivated, agricultural output and productivity, and investments (Kimenyi et al., 2014; Adelaja and George, 2019; Mitchell, 2019). Conflicts also reduce farmers' cattle holdings by increasing cattle thefts and losses and reducing cattle purchases (George et al., 2021).

Climate-change related shocks and the COVID-19 crisis may likely exacerbate the incidence of conflicts and subsequently affect livelihoods and food security of households (Abel et al., 2019). The Boko Haram terrorist insurgencies in the north-east Nigeria, pastoralists attacks in the central belt and south-east of the country, and bandit attacks are major concerns affecting livelihoods, agriculture, and food security in recent years. The farmer–herder conflict resulted in intense land competition and led to violent clashes among herders and farmers in many parts of Nigeria (George et al., 2021). In the past year, news headlines have been filled with recurring cases of kidnapping, banditry or armed robbery, Boko Haram insurgency, land border or communal clashes, and farmer–herder conflicts. The rising incidence of conflict in the past year may be linked to restrictive COVID-19 measures but could more broadly be a manifestation of the underlying socioeconomic pressures, including unemployment and economic instability.

To assess the effects of conflicts/insecurity threats on farming activities, a new module was added in the follow-up survey (see appendix Table A5). Figure 5 (left panel) presents the proportion survey households who experienced security threats in the last 12 months (July 2020 to June 2021). Results show that in the four states surveyed (Kebbi, Benue, Delta and Ebonyi), about 40 to 70 percent of survey households experienced insecurity threats in the last 12 months. As expected, given trends in conflict incidents, households in Kebbi state (North-West), having frequent bandit attacks, experienced the highest incidence of insecurity threats (67 percent of respondents). A similar study on households' insecurity experience during the COVID-19 pandemic reported comparable results to ours for other northern states of Nigeria (Verjee, 2020). However, we must be clear that the conflicts and insecurity challenges in northern Nigeria have existed over a decade before COVID-19; thus, we are careful not to directly associate the insecurity threats with COVID-19.

To examine whether COVID-19 has a role to play in rising insecurity, respondents were asked to compare their current insecurity experience with the pre-COVID-19 period. About 73 percent of the respondents indicated that the insecurity threats had increased over the last 12 months compared to the situation in the year before COVID-19 (Figure 6, right panel).

Figure 5. Households' experience in conflicts/local security threats



Source: Authors' compilation from the second-round phone survey data (July 2021)

The sources/types of insecurity threats range from Boko-Haram insurgence to kidnapping, farmer–herder conflict, robbery, banditry, looting, and rustling of livestock, among others. We asked respondents to identify the three dominant security threats to their household or community. As expected, the farmer–herder conflicts were found to be the most prominent threat (38 percent of survey respondents) followed by robbery (34.8 percent) and kidnapping (31 percent).

Using a 4-point Likert scale measure (1=Extremely severe; 2=Moderately Severe, 3=Slightly severe, and 4=Not at all), we further assessed how the insecurity threats have affected four key agricultural activities and decisions – namely access to agricultural inputs markets, agricultural output markets, farming operations, and farming expansion or investment. As shown in Table 6, all four agricultural activities were negatively affected by the incidence of insecurity challenges. Examining the more severe impacts, overall, the agricultural activities of 33 to 44 percent of survey households were extremely or moderately severely affected by insecurity threats. Particularly, *farm expansion or investment* decisions are the most affected activity (44 percent of farmers). This highlights the long-term significance of the effects of insecurity on smallholder farm households because lack of investment is expected to reduce farm productivity, income, and food security in the future.

Table 6. Effects of insecurity threats on agricultural activities

Questions: How severely has the presence of insecurity threats affected your household's: […….]	Respondent's subjective assessment of severity of insecurity threats on major agricultural activities, prices, and markets (%)				
	Extremely severe (a)	Moderately Severe (b)	(a)+(b)	Slightly severe (c)	Not at all (d)
1.…access to **agricultural input markets**?	18.33	17.26	**36**	20.83	43.57
2.…access to **market to sell agricultural produce**?	16.79	16.31	**33**	21.07	45.83
3.…**normal farm operations** (planting, ploughing, weeding, harvesting)?	19.17	16.07	**35**	21.43	43.33
4.…**farm investments** (e.g., expand cultivated area; more livestock)?	18.93	15.12	**44**	21.10	44.76

Source: Authors' compilation from the second-round phone survey data (July 2021)

5. Econometric results

In the section, we present the estimation results of the ordered logit model for FIES and logit probability models on COVID-19 testing and vaccination. We first present the estimation results focusing on the effects of household income loss, wealth and assets, social capital, and government or NGO interventions on the severity of food insecurity of households using the FIES measure. We then report estimation results for the factors affecting households' decisions on getting COVID-19 testing and vaccination.

5.1 Factors affecting household FIES amid COVID-19

Table 7 reports the results of the ordered logit model estimation. We focus on the factors of interest described in the conceptual framework (section 2.3). The regressors are jointly statistically significant at 1 percent level (Wald Chi^2 (16) test statistic, p= 0.000). The ordered logit threshold parameters in the model appear to be statistically significant, i.e., they are significantly different from each other, so the four FIES categories should not be collapsed into three categories. The estimated coefficients of the factors discussed in section 2.3 (income loss, wealth endowments, social capital, government/NGO support programs, and conflicts) on the severity of FIES remain sizeable and strongly statistically significant even after controlling for other covariates.

In ordered logit models, in general, positive coefficients indicate that increases in the regressors decrease the probability of the subject being in the "lower" category, i.e., a positive coefficient increases the probability of the subject being in the "higher" category as defined in a specific study. In our study, a "higher" category refers to the household's position on a more severe FIES scale and "lower" category

indicates the household is less food insecure (i.e., more food secure). Examining the effects of income loss amid the pandemic, the positive and statistically significant (at 1 percent level) coefficient shows that the severity level of the latent food insecurity indicator variable (FIES) increases with increases in income loss. This is in accordance with *a priori* expectations. The marginal effect of income loss further indicates that a one percent increase in income loss (income loss measured in percentage) reduces the probability of the household being in a less severe food insecurity category by 1.6 percent. On the other hand, a rise of 1 percent in income loss increases the probability of a household being in the most severe food insecurity category by 3 percent.

Land and livestock are two important household assets in rural Africa (Mulwa and Visser, 2020; Wodajo et al., 2020). These assets can be used as productive factors (e.g., expand cultivated land or using livestock as draught animal power); as income sources (e.g., land rent income or selling animals or animal products); and as direct food sources (e.g., milk and meat). The combined effects of these assets could increase the household's capacity to withstand shocks. Our empirical results vividly demonstrate the role that such assets play in mitigating the risk of household food insecurity due to external shocks. The negative and statistically significant (at 5 percent level) coefficients of "land size" and "'livestock size" show that the severity level of the food insecurity indicator variable, FIES, decreases with increases in these assets. In other words, households with more of these assets are less likely to fall into the more severe food insecurity categories.

In addition to the effects of income loss and wealth factors, we are also interested in exploring the role and significance of social capital and government/NGO support mechanisms in mitigating household food insecurity amid the COVID-19 pandemic. Considering the longstanding nature of social capital among communities in African countries and the government/NGO claims on large-scale provision of assistance (cash, food, and nonfood) to the households, we anticipate that support mechanisms from both sources played a significant role in safeguarding households' food security amid the pandemic. Though the social support mechanisms are statistically significant[7] (at 1 percent level) in mitigating the severity of food insecurity amid the pandemic; external interventions (government/NGOs) did not provide statistically significant effects on preventing households from falling into a more severe food insecurity condition. The government/NGO also seem to be too stretched to reach millions of vulnerable households. Logistical challenges, poor infrastructure, inefficiencies, and corruption along the distribution channels could be additional explanations for the inability of external interventions to mitigate household food insecurity in Nigeria (Ozili, 2020).

[7] In the baseline survey, the effect of social support mechanism on FIES was not statistically significant. The plausible explanation then was that everyone was suffering the COVID-19 shock and there had been little time to adjust for the shock. Thus, individuals and households less able to support one another as they did in more normal times. However, just after a year later, due to adjustment, social support started functioning again.

Table 7. Estimation results of ordered logit model for Food Insecurity Experience Scale (FIES), coefficients and marginal effects†

Variable name	Model coefficients		Marginal Effects (ME) of covariates for FIES: 1, 2, 3 and 4							
	Coeffici-ent	Standard error (Robust)	ME, FIES=1 (dy/dx)	Standard error ME, FIES=1	ME, FIES=2 (dy/dx)	Standard error ME, FIES=2	ME, FIES=3 (dy/dx)	Standard error ME, FIES=3	ME, FIES=4 (dy/dx)	Standard error ME, FIES=4
HH income loss amid-COVID (%)	1.527***	0.350	-0.160***	0.038	-0.072***	0.017	-0.060***	0.014	0.292***	0.064
Land size owned (ha)	-0.053**	0.021	0.006**	0.002	0.002**	0.001	0.002**	0.001	-0.010**	0.004
Livestock size owned (TLU)	-0.021**	0.010	0.002**	0.001	0.001**	0.000	0.001**	0.000	-0.004**	0.002
Received family/friends support (yes=1)	0.535***	0.161	-0.056***	0.017	-0.025***	0.008	-0.021***	0.007	0.102***	0.030
Received gov./NGO support (yes=1)	-0.026	0.261	0.003	0.027	0.001	0.012	0.001	0.010	-0.005	0.050
HH exposed insecurity threat (yes=1)	0.279*	0.158	-0.029*	0.017	-0.013*	0.008	-0.011*	0.006	0.053*	0.030
Number of shocks encountered (#)	0.278***	0.044	-0.029***	0.005	-0.013***	0.002	-0.011***	0.002	0.053***	0.008
Location Northern states (yes=1)	0.770***	0.184	0.081***	0.020	0.036***	0.009	0.030***	0.008	-0.147***	0.034
HH in rural area (yes=1)	0.278*	0.164	-0.029*	0.017	-0.013*	0.008	-0.011*	0.007	0.053*	0.031
HH head male (yes=1)	-0.216	0.165	0.023	0.017	0.010	0.008	0.009	0.007	-0.041	0.031
HH head married (yes=1)	-0.265	0.221	0.028	0.023	0.012	0.010	0.010	0.009	-0.051	0.042
HH head age (years)	-0.026***	0.007	0.003***	0.001	0.001***	0.000	0.001***	0.000	-0.005***	0.001
Education above secondary (yes=1)	-0.282*	0.158	0.030*	0.017	0.013*	0.007	0.011*	0.006	-0.054*	0.030
Household size (#)	0.054***	0.023	-0.006**	0.002	-0.003**	0.001	-0.002**	0.001	0.010**	0.004
HH member of MFI (yes=1)	0.122	0.156	-0.013	0.016	-0.006	0.007	-0.005	0.006	0.023	0.030
HH member migrated_COVID-19 (yes=1)	-0.072	0.191	0.008	0.020	0.003	0.009	0.003	0.008	-0.014	0.037
HH receive non-farm income(yes=1)	-0.042	0.185	0.004	0.019	0.002	0.009	0.002	0.007	-0.008	0.035
/Cut1	-1.811	0.441								
/Cut2	-1.088	0.437								
/Cut3	-0.364	0.435								
Mean dependent var	3.282		SD dependent var.		1.099					
Pseudo r-squared	0.096		Number of obs.		840					
Wald Chi2(16)	164.498		Prob > chi2		0.000					

Source: Authors' ordered logit estimation results (Data: Follow-up phone survey, July 2021)
*** *p<0.01,* ** *p<0.05,* * *p<0.1.* Note: †Marginal effects (dy/dx) are average marginal effects (AME), i.e., evaluated at the sample values and then averaged. ME= Marginal effects. MEs for factor variables is the discrete change from the base level. HH= Household; ha= hectare; TLU=Tropical Livestock Unit. MFI= microfinance institutions

Food insecurity and poverty levels have spatial heterogeneity in Nigeria due to differences in environmental or socio-cultural factors. For instance, the northern regions of Nigeria have been severely affected by conflicts and security threats (e.g., attacks from Boko Haram), which have affected the lives and livelihoods of millions of people in the region facing hunger and acute malnutrition (Kah, 2017; Amare et al., 2018). We introduced a regional dummy as well as an insecurity dummy to account for this spatial dimension of the pandemic. The positive and statistically significant coefficients of these two dummies suggest that households in the northern region of Nigeria and those exposed to conflicts are significantly more likely to fall in the highly severe food insecurity class. The results in Table 6 show that households in northern Nigeria are 77 percent less likely to be food secure compared to their counterparts in the other regions of the country. Similarly, a typical household exposed to conflicts is 28 percent less likely to be food secure compared with households not exposed to conflicts amid the pandemic. Our finding is consistent with previous studies (Ogunniyi et al., 2016; Amare et al., 2018) that report the high prevalence of food insecurity and acute malnutrition problems in northern Nigeria. The results suggest that the COVID-19 pandemic likely aggravated the already existing food insecurity challenges in the northern Nigeria.

5.2 Factors affecting household decisions on COVID-19 testing and vaccination

Generally, like many other African countries south of the Sahara, Nigeria is among the lowest in terms of COVID-19 testing and vaccination. As of October 23, 2021, only 1.6 percent and 1.4 percent of the total Nigerian population were respectively tested and fully vaccinated for COVID-19. A combination of several micro- and macro-economic, social, cultural, logistical, and religious factors can explain the observed low rate of testing and vaccination in the country. To understand how micro-level factors affect households' decisions on COVID-19 testing and vaccination, in our follow-up phone survey we collected household-level data related to testing and vaccination. Selection of the key covariates included in the models was based on the importance of the factors in influencing individual or household-level decisions in the context of Nigeria.

A total of 14 variables were identified to explain COVID-19 testing and vaccination decisions (see the list in Table 1). These factors are grouped under three clusters:

(a) Geographic and demographic factors including northern vs. rest of Nigeria, rural vs. urban, head of the household, age, household size, and education level of the head. The potential effects of these factors seem intuitive, but why northern Nigeria? Three distinctive reasons: (i) Islam is the dominant religion in northern Nigeria compared to the rest of the country, (ii) northern Nigeria is highly exposed to conflicts including the Boko Haram insurgencies, and (iii) northern Nigeria disproportionality hosts large numbers of NGO operations. So, the combined effects of these factors differentiate northern Nigeria from the rest of the country.

(b) Main livelihood activities including farming, nonfarm family business, and wage employment.

(c) Access related factors including access to information, roads/transport, health services, membership of local associations, and exposure to conflicts/insecurity. These factors may promote or hinder decisions to get tested and/or vaccinated.

Table 8. Estimation results of logit models on factors affecting COVID-19 testing and vaccination decisions, coefficients, and marginal effects (M.Es.)

Variable name	Got tested for C-19			Got vaccinated for C-19		
	Coefficient	Std. error (robust)	M.Es. (dy/dx)	Coefficient	Std. error (robust)	M.Es. (dy/dx)
Northern states (yes=1)	-0.264	0.203	-0.046	0.424**	0.198	0.070**
HH in rural area (yes=1)	0.012	0.184	0.002	-0.022	0.185	-0.004
HH head male (yes=1)	0.190	0.182	0.033	-0.307*	0.185	-0.051*
HH head age (years)	-0.004	0.008	-0.001	0.004	0.009	0.001
Household size (#)	0.061***	0.021	0.011***	0.084***	0.023	0.014***
Educ. above secondary (yes=1)	0.307*	0.179	0.053*	0.386**	0.184	0.064**
HH livelihood on-farm (yes=1)	0.246	0.184	0.043	0.283	0.188	0.047
Non-farm business income(yes=1)	0.270	0.203	0.047	-0.347**	0.194	-0.058*
HH wage income (yes=1)	-0.234	0.175	-0.041	0.007	0.968	0.318
Access to C-19 info (yes=1)	0.338*	0.190	0.059*	0.264	0.193	0.044
Access to health (yes=1)	0.270*	0.271	0.047*	0.598**	0.297	0.099*
Access to roads (yes=1)	0.423**	0.196	0.074*	0.117	0.196	0.019
Member association (yes=1)	0.251	0.176	0.044	0.058	0.183	0.010
HH exposed insecurity (yes=1)	0.257	0.173	0.045	0.379**	0.178	0.063**
Constant	-3.052**	0.540	-	-3.182***	0.528	-

C-19 testing logit model diagnostics		**C-19 vaccination logit model diagnostics**	
Mean dependent var.	0.239	Mean dependent var.	0.236
Pseudo r-squared	0.038	Pseudo r-squared	0.068
Chi-square	35.181	Chi-square	53.883
SD dependent var	0.427	SD dependent var	0.425
Number of obs.	840.00	Number of obs.	840.00
Prob > chi2	0.001	Prob > chi2	0.000

**** p<0.01, ** p<0.05, * p<0.1*

Note: C-19= COVID-19; HH= Household; ha= hectare; TLU=Tropical Livestock Unit. AME= average marginal effects

Table 8 reports the coefficients and marginal effects of covariates of two logit models on the likelihood of households for COVID-19 testing and vaccination decisions. The results depicted in first three columns of Table 8 are for the testing decision model, and the last three columns present results for the vaccination decision. Four factors including *household size, education of the household head, regular access to COVID-19 related information,* and *access to health services* reveal positive and statistically significant influences

on decisions to get tested for COVID-19. Given the human-to-human transmission of the coronavirus, households with larger family size are more likely to be exposed to the virus. Thus, the predicted increased likelihood of testing with increasing household size seems intuitive. The likelihood of testing increases in education, information access, and access to health services. In contrast to our *a priori* expectations, we find that geographic factors (northern, rural), social capital (membership to local associations), livelihood activities (farm vs. nonfarm), and exposure to security threats are not statically significant.

Interestingly, in our examination of the coefficients of factors for vaccination decisions, we see that households in the northern Nigeria are more likely (significant at 5 percent) to get vaccinated. This is a counterintuitive result because, given religious conservatism and frequent insecurity threats, we expected high resistance to vaccination. One possible explanation for this counterintuitive finding could be the impacts of several interventions by various NGOs in the region. These interventions might have influenced positive thinking and hence willingness to get vaccinated. Another seemingly counterintuitive result is the negative coefficient for the "male-headed households" which implies that these households are less likely to get vaccinated for coronavirus. However, this result appears to reflect a possible association of gender roles in Nigerian society. Smallholder women are the main market agents in micro and small businesses, including for agricultural products, and hence have more social interactions buyers and sellers. This might have influenced women's decisions to get vaccinated to minimize the risk of contracting the virus. We also see a positive and statistically significant (at 5 percent level) coefficient of the "insecurity exposure" variable to vaccination decision. Like the "regional" variable above, this might also be associated to the impact of many NGOs operating in conflict-affected zones. Other significant variables in the vaccination regression (i.e., household size, education, and access to health services) can be interpreted in the same way as in the COVID-19 testing regression model.

6. Summary and policy implications

The effects of economic and livelihood disruptions caused by the COVID-19 pandemic on households' income, jobs, and food security have continued over the last two years despite perceptible reductions in transmission rates and lifting of lockdowns and other restrictive policy measures in several countries. Like other African countries south of the Sahara, the livelihoods and food security of households (especially less endowed households) were severely and disproportionately affected by the pandemic. To assess these effects on Nigerian households, we collected data from a sample of households in the initial three months after the outbreak of the pandemic (April 2020 to June 2020). Results from the first survey showed that about 88 percent of the households reported 50 percent income loss due to the pandemic; 66 percent reported a reduced food consumption; and COVID-19 significantly worsened the food insecurity

situation of many households, especially poorer households (Balana et al., 2020). Survey households also reported a significant reduction in consumption of proteins (eggs, meat, and dairy products) and fruits since the pandemic struck. Increases in food prices were felt by most households (85 percent). Similar findings were reported in other studies conducted within the first three months of COVID-19 in Nigeria (Amare et al., 2020; World Bank and NBS, 2020; Andam et al., 2020).

The purpose of this study was to assess the changes in the livelihoods and food security situation of households over the past year (since our first-round phone survey in July 2020). To track the changes in the effects of the pandemic since the first-round survey, we administered a follow-up phone survey a year later (July 2021) with respondents who had participated in the first-round survey. About 82 percent of the original sample households (840 respondents of the 1,031 in the first-round) were recovered in a follow-up survey. Key questions on incomes, employment/labor movement, food security and nutrition, and coping strategies in the first-round survey were maintained in the follow-up survey. To accommodate changes in certain emerging issues since the first-round survey, the follow-up survey included additional questions on conflicts/insecurity threats, shocks other than COVID-19, access to basic services (such as markets, credit, and clean water), and households' perception and behavior on COVID-19 testing and vaccines.

Our comparative analysis between the two surveys focused on the changes on key outcome variables including income loss, job loss, food security, and dietary diversity of households since the baseline survey using basic descriptive statistics such as frequency, percentages changes, and means. In our analysis, we focused on food security as our main outcome variable and how changes and endowments of four key livelihood enhancing variables (income loss, wealth endowments like land and livestock, social capital, and government/NGO support programs), as well as how rising insecurity affects the severity of food insecurity of households amid COVD-19. We obtained the following key findings:

Changes in income loss – Whereas the average household income loss was 43 percent during the first three months of the pandemic (first-round survey in July 2020); the corresponding income loss in the follow-up survey (July 2021) is 22 percent, i.e., a reduction of about 50 percent in income loss. This appears to be a significant rebound in household income. In terms of the number of households that suffered income loss, though 88 percent of the households reported up to a 50 percent household income loss in the first survey, the percentage of households that reported income loss fell to 62 percent in the follow-up survey, with an average income loss of about 35 percent.

Changes in job loss – Similar to the recovery in income, we observed a rebound in employment too – from a reported job loss of 42 percent among the respondents in the first survey to 21 percent in the follow-up survey, i.e., a recovery of 50 percent . However, it should be noted that job losses or unemployment

problems amid COVID-19 cannot be attributed entirely to the pandemic; rather, the problem appears to be an existing structural problem though the economic disruption caused by COVID-19 played its part. For instance, the results from the follow-up survey have shown that only 8 percent of the unemployed labor were laid-off from their previous jobs due the COVID-19 and an overwhelming majority of the unemployed did not have jobs in the first place or were casual workers who had recently lost their jobs for reasons unrelated to COVID-19.

Changes in food insecurity – In both surveys the severity of households' food insecurity was measured using experienced-based individual's "'yes/no" responses to the eight FIES questions and the entire survey households were clustered into four ordered categories (1=food secure; 2=mildly for insecure; 3=moderately food insecure; and 4=severely food insecure). Comparison of the results from the two surveys indicate that there is a slight increase in "food secure" households (from 7 to 13 percent) and a 1 percentage point increase in "mildly food insecure" households (from 8 percent to 9 percent). Households in the "moderately food insecure" group remain almost the same. Importantly, the "severely food insecure" households dropped from 73 percent in the first survey to 65 percent in the follow-up survey (i.e., a drop of 8 percentage points). This indicates positive transitions of household from more severe food insecurity to less severe food insecurity situations.

Changes in dietary diversity – We found that more than 75 percent of households have a diversity score of above 6, 21 percent of which have a 12-out-of-12 diversity score. Comparison of these results with the findings in first survey data (70 percent households had scores above 6 and 16 percent households had 12-out-of-12 scores) demonstrates an improvement of 5 percentage points in the HDDS results in the follow-up round survey.

Conflicts and insecurity threats – About 73 percent of the respondents in the second survey indicated that insecurity threats had increased over the last 12 months compared to the situation in the same period before COVID-19. Using a 4–point Likert scale measure (1=Extremely severe; 2=Moderately Severe, 3=Slightly severe, and 4=Not at all), we further assessed how the insecurity threats have affected key agricultural activities and decisions. In examining the more severe impacts, we find that the agricultural activities of 33 to 44 percent of survey households were extremely severely or moderately severely affected by insecurity threats. Particularly, farm investment decisions are the most affected activity (by 44 percent of farmers). This highlights the long-term significance of the effects of insecurity on smallholder farm households because lack of investment reduces farm productivity, income, and food security in future.

The econometric estimation results show that income loss amid the pandemic has significantly affected the food security condition of households. Regarding the wealth effect, our results show livestock ownership

significantly cushioned households from falling into a severe food insecurity situation amid the pandemic. Results on the role of social capital as a risk coping strategy indicate that a year after the first survey, the capacities of households to help each other recovered, i.e., social capital regained to play its usual risk-mitigating role in the times of shocks. On the contrary, government and NGO safety net programs were not yet significant in providing protection to households from severe food insecurity or malnutrition. This may be because such support is limited in either scale or scope compared to the magnitude of the shock.

Based on these findings, we suggest the following policy propositions: (1) People with casual and informal jobs seem more likely to lose their jobs and consequently their income and are susceptible to severe food insecurity in times of shocks as a result. Investment in job creation needs to be a policy priority for government to prevent income losses and to improve the resilience of households to shocks. (2) Building the wealth and asset base of households is an important strategy in the long run to reduce vulnerability to shocks. Policy also should encourage livelihood diversification in the form of mixed crop-livestock farming systems because livestock ownership demonstrated a positive and significant impact on food security during the shock. (3) Safety net programs and other forms of support mechanisms need to revisit targeting criteria and outreach strategies to enhance the effectiveness of interventions. (4) Recurrent conflicts and persistent insecurity threats affect investment decisions of farmers. This will negatively affect farm productivity, income, and food security now and in the future. Thus, governments at all levels (federal, state, and local) should consider devising and implementing workable conflict resolution approaches as a key policy priority to create a favorable environment for ordinary economic activities to take place.

References

Abel, G.J., Brottrager, M., Cuaresma, J.C., and Muttarak, R. 2019. "Climate, conflict and forced migration." *Global Environmental Change* 54: 239-149.

Adelaja, A., and George, J. 2019. "Effects of Conflict on Agriculture: Evidence from the Boko Haram Insurgency." *World Development* 117: 184-195.

Akter, S., and Basher, S.A. 2014. "The Impacts of Food Price and Income Shocks on Household Food Security and Economic Well-Being: Evidence from Rural Bangladesh." *Global Environmental Change 25:* 150-162.

Amare, M., Abay, K.A., Tiberti, L., and Chamberlin, J. 2021. "COVID-19 and food security: Panel data evidence from Nigeria." *Food Policy* 101: 102099.

Amare, M., Balana, B., and Ogunniyi, A. 2020. *The Role of Agriculture in Reducing Child Undernutrition in Nigeria.* IFPRI working paper No. 62.

Amare, M., Benson, T., Fadare, O., and Oyeyemi, M. 2018. *Study of the Determinants of Chronic Malnutrition in Northern Nigeria: Quantitative Evidence from the Nigeria Demographic and Health Surveys.* IFPRI Working Paper 45.

Andam, K., Edeh, H., Oboh, V., Pauw, K., and Thurlow, J. 2020. "Impacts of COVID-19 on Food Systems and Poverty in Nigeria." *Advances in Food Security and Sustainability* 5: 145.

Andersen, L.E., and Cardona, M. 2013. *Building Resilience Against Adverse Shocks: What are the Determinants of Vulnerability and Resilience*? Development Research Working paper. No. 02.

Asfaw, S., Pallante, G., and Palma, A., 2018. "Diversification Strategies and Adaptation Deficit: Evidence from Rural Communities in Niger." *World Development* 101: 219-234.

Ayebare, R.R., Flick, R., Okware, S., Bodo, B., and Lamorde, M. 2020. "Adoption of COVID-19 Triage Strategies for Low-Income Settings." *The Lancet Respiratory Medicine* 8 (4): e22.

Balana, B.B., Oyeyemi, M. A., Ogunniyi, A.I., Fasoranti, A., Edeh, H., Aiki, J., & Andam, K. S. 2020. *The Effects of COVID-19 Policies on Livelihoods and Food Security of Smallholder Farm Households in Nigeria: Descriptive Results from a Phone Survey.* IFPRI Discussion paper. No. 1979

Barrett, C., and Carter, M.R., 2013. "The Economics of Poverty Traps and Persistent Poverty: Empirical and Policy Implications." *Journal of Development Studies* 49 (7): 976-990.

Ben Hassen, T., El Bilali, H., & Allahyari, M.S. 2020. "Impact of COVID-19 on Food Behavior and Consumption in Qatar." *Sustainability* 12 (17): 6973.

Bennett, K., and Phillipson, J. 2004. "A Plague upon Their Houses: Revelations of the Foot and Mouth Disease Epidemic for Business Households". *Sociologia Ruralis* 44 (3): 261-284.

Berchoux, T., Watmough, G.R., Hutton, C.W. and Atkinson, P.M. 2019. "Agricultural Shocks and Drivers of Livelihood Precariousness across Indian Rural Communities." *Landscape and Urban Planning* 189: 307-319.

Brenton, P., and Chemutai, V. 2020. *Trade Responses to the COVID-19 Crisis in Africa*. Trade and COVID-19 Guidance Note. World Bank, Washington, DC. http://hdl.handle.net/10986/33548

Cafiero, C., Viviani, S., and Nord, M. 2018. "Food Security Measurement in a Global Context: The Food Insecurity Experience Scale." *Measurement* 116: 146-152.

Caggiano, G., Castelnuovo, E., and Kima, R. 2020. "The global effects of Covid-19-induced uncertainty." *Economics Letters* 194: 109392.

Cameron, A.C., and Trivedi, P.K. 2010. *Microeconometrics Using STATA* (Vol. 2). College Station, TX: Stata press.

Chenarides, L., Grebitus, C., Lusk, J.L., and Printezis, I. 2021. "Food Consumption Behavior during the COVID-19 pandemic." *Agribusiness* 37 (1): 44-81.

Cho, S.J., Lee, J.Y., and Winters, J.V., 2020. "Employment Impacts of the COVID-19 Pandemic across Metropolitan Status and Size." *Growth and Change.* https://doi.org/10.1111/grow.12540

Cochrane, L., and Cafer, A. 2018. "Does Diversification Enhance Community Resilience? A Critical Perspective. *Resilience* 6 (2): 129-143.

Cortes, G.M., and Forsythe, E. 2020. *The Heterogeneous Labor Market Impacts of the Covid19 Pandemic*. W.E. Upjohn Institute. https://doi.org/10.17848/wp20-327

Dang, H.A.H. and Nguyen, C.V. 2021. "Gender inequality during the COVID-19 pandemic: Income, expenditure, savings, and job loss." *World Development* 140: 105296. https://doi.org/10.1016/j.worlddev.2020.105296.

Deaton, B.J., and Deaton, B.J. 2020. "Food Security and Canada's Agricultural System Challenged by COVID-19." *Canadian Journal of Agricultural Economics* 68 (2): 143-149.

Devereux, S. 2016. "Social Protection for Enhanced Food Security in sub-Saharan Africa." *Food Policy* 60: 52-62.

Devereux, S., Béné, C., and Hoddinott, J. 2020. "Conceptualizing COVID-19's Impacts on Household Food security." *Food Security* 12 (4):769-772.

DFID, 1999. *Sustainable Livelihood Guidance Sheets*. DFID, London, UK

Ellis, F. 1998. "Household Strategies and Rural Livelihood Diversification." *Journal of development Studies* 35 (1): 1-38.

Eranga, I.O.E. 2020. "COVID-19 Pandemic in Nigeria: Palliative Measures and the Politics of Vulnerability." *International Journal of Maternal and Child Health and AIDS* 9 (2): 220-236.

Eriksen, S.H., Brown, K., and Kelly, P.M. 2005. "The dynamics of vulnerability: locating coping strategies in Kenya and Tanzania." *Geographical Journal* 171(4): 287-305.

FAO. 2016. *Methods for estimating comparable rates of food insecurity experienced by adults throughout the world*. Rome: FAO.

FAO. 2020. *Addressing the Impacts of COVID-19 in Food Crises*. April–December 2020. http://www.fao.org/documents/card/en/c/ca8497en/ (accessed on 8 Oct.2021)

George, J., Adelaja, A. and Awokuse, T.O. 2021. "The Agricultural Impacts of Armed Conflicts: The Case of Fulani Militia." *European Review of Agricultural Economics* 48 (3): 538-572.

Gershon, O., Matthew, O., Osuagwu, E., Osabohien, R., Ekhator-Mobayode, U.E., and Osabuohien, E. 2020. "Household Access to Agricultural Credit and Agricultural Production in Nigeria: A Propensity Score Matching Model." *South African Journal of Economic and Management Sciences* 23 (1): 1-11.

Headey, D., Heidkamp, R., Osendarp, S., Ruel, M., Scott, N., Black, R., and Walker, N. 2020. "Impacts of COVID-19 on childhood malnutrition and nutrition-related mortality." *The Lancet* 396 (10250): 519-521.

Hirvonen, K., de Brauw, A., and Abate, G.T. 2021. Food Consumption and Food Security during the COVID-19 Pandemic in Addis Ababa. *American Journal of Agricultural Economics 103*(3): 772-789.

Isangha, S.O., Choi, W.M.A., and Chiu, M.Y.L. 2021. "COVID-19: Where are the Nigerian Social Workers?" *Qualitative Social Work* 20 (1-2): 343-349.

Javadinejad, S., Dara, R., and Jafary, F. 2021. "Analysis and Prioritization the Effective Factors on Increasing Farmers Resilience under Climate Change and Drought." *Agricultural Research* 10 (3):497-513.

Kah, H.K. 2017. "Boko Haram is Losing, but So is Food Production: Conflict and Food Insecurity in Nigeria and Cameroon." *Africa Development* 42 (3):177-196.

Kimenyi, M., Adibe, J., Djiré, M., Jirgi, A.J. Kergna, A., Deressa, T.T., Jessica E. Pugliese, J.E., and Westbury, A. 2014. *The Impact of Conflict and Political Instability on Agricultural Investments in Mali and Nigeria*. Africa Growth Initiative Working Paper 17. Brookings.

Laborde, D., Martin, W., Swinnen, J., and Vos, R. 2020. "COVID-19 Risks to Global Food Security." *Science* 369 (6503): 500-502.

Mahmud, M., and Riley, E. 2021. "Household Response to an Extreme Shock: Evidence on the Immediate Impact of the Covid-19 Lockdown on Economic Outcomes and Well-Being in Rural Uganda." *World Development* 140: 105318.

Makate, C., Makate, M., Mango, N., and Siziba, S. 2019. "Increasing Resilience of Smallholder Farmers to Climate Change through Multiple Adoption of Proven Climate-Smart Agriculture Innovations. Lessons from Southern Africa." *Journal of Environmental Management* 231: 858-868.

Manda, J., Alene, A.D., Tufa, A.H., Feleke, S., Abdoulaye, T., Omoigui, L.O., and Manyong, V. 2020. "Market Participation, Household Food Security, and Income: The case of Cowpea Producers in Northern Nigeria." *Food and Energy Security* 9 (3): e211.

Martin, S.M., and Lorenzen, K.A.I. 2016. "Livelihood Diversification in Rural Laos". *World Development* 83: 231-243.

Matthew, O., Adeniji, A., Osabohien, R., Olawande, T., and Atolagbe, T. 2020. "Gender Inequality, Maternal Mortality and Inclusive Growth in Nigeria." *Social Indicators Research* 147 (3): 763-780.

Maxwell, D., Vaitla, B., and Coates, J. 2014. "How do Indicators of Household Food Insecurity Measure Up? An Empirical Comparison from Ethiopia." *Food policy* 47: 107-116.

Mbugua, M., and Nzuma, J. 2020. "Effect of Social Networks on Household Dietary Diversity: Evidence from Smallholder Farmers in Kisii and Nyamira Counties, Kenya." *African Journal of Agricultural and Resource Economics* 15: 230-243.

Mishra, K., and Rampal, J. 2020. "The COVID-19 Pandemic and Food Insecurity: A Viewpoint on India." *World Development* 135 (10): 50-68.

Mitchell, D. 2019. "The Cycle of Insecurity: Reassessing the Security Dilemma as a Conflict Analysis Tool." *Peace and Conflict Studies* 26 (2): 1.

Mitter, H., Heumesser, C., and Schmid, E., 2015. "Spatial Modeling of Robust Crop Production Portfolios to Assess Agricultural Vulnerability and Adaptation to Climate Change." *Land Use Policy* 46: 75-97.

Mulwa, C.K., and Visser, M. 2020. "Farm Diversification as an Adaptation Strategy to Climatic Shocks and Implications for Food Security in Northern Namibia." *World Development* 129: 104906.

NBS (National Bureau of Statistics), Nigeria. 2021. Consumer Price Index August 2021. Available at https://nigerianstat.gov.ng/elibrary

Ngigi, M.W., Mueller, U., and Birner, R.,2020. "Livestock Diversification for Improved Resilience and Welfare Outcomes under Climate Risks in Kenya." *The European Journal of Development Research*, 1-24.

Ogechi, U.P., and Chilezie, O.V. 2017. "Assessment of Dietary Diversity Score, Nutritional Status and Socio-Demographic Characteristics of Under-5 Children in Some Rural Areas of Imo State, Nigeria." *Malaysian Journal of Nutrition* 23 (3).

Ogunniyi A., Olagunju, K., Kabir, S.K., and Adeyemi, O. 2016. "Social Crisis, Terrorism and Food Poverty Dynamics: Evidence from Northern Nigeria." *International Journal of Economics and Financial Issues* 6 (4): 1865-1872.

Okeke-Ihejirika, P., Oriola, T.B., Salami, B., Obiefune, M., Ejike, N., Olutola, A., and Irinoye, O. 2020. "Beyond Poverty Fixation: Interrogating the Experiences of Internally Displaced Persons in Nigeria." *Third World Quarterly* 41 (9): 1476-1497.

Oleribe, O., Ezechi, O., Osita-Oleribe, P., Olawepo, O., Musa, A.Z., Omoluabi, A., Fertleman, M., Salako, B.L., and Taylor-Robinson, S.D. 2020. "Public Perception of COVID-19 Management and Response in Nigeria: A Cross-Sectional Survey." *BMJ Open* 10 (10): 041936.

Onyeji, G.N., and Sanusi, R.A. 2020. "Dietary Diversity of Reproductive Age Women in Three South-Eastern States of Nigeria." *African Journal of Food, Agriculture, Nutrition and Development* 20 (2): 15490-15508.

Osabohien, R., Mordi, A., and Ogundipe, A. 2020. "Access to Credit and Agricultural Sector Performance in Nigeria." *African Journal of Science, Technology, Innovation and Development* 1-9.

Otekunrin, O.A., Otekunrin, O.A., Fasina, F.O., Omotayo, A.O., and Akram, M. 2020. "Assessing the Zero-Hunger Target Readiness in Africa in the Face of COVID-19 Pandemic." *Caraka Tani Journal of Sustainable Agriculture* 35 (2): 213-227.

Ozili, P.K. 2020. "Covid-19 Pandemic and Economic Crisis: The Nigerian Experience and Structural Causes." *Journal of Economic and Administrative Sciences* 37 (4): 401-418

Phillipson, J., Gorton, M., Turner, R., Shucksmith, M., Aitken-McDermott, K., Areal, F., Cowie, P., Hubbard, C., Maioli, S., McAreavey, R., and Souza-Monteiro, D. 2020. "The COVID-19 Pandemic and Its Implications for Rural Economies." *Sustainability* 12 (10): 3973.

Rufai, A.M., Ogunniyi, A.I., Abioye, O.D., Birindwa, A.B., Olagunju, K.O., and Omotayo, A.O. 2021. "Does Economic Shocks Influence Household's Healthcare Expenditure? Evidence from Rural Nigeria." *Heliyon* 7 (5): e06897.

Saccone, D. 2021. "Can the Covid19 Pandemic Affect the Achievement of the 'Zero Hunger' Goal? Some Preliminary Reflections." *The European Journal of Health Economics* 1-14.

Shucksmith, M. 2012. *Future Directions in rural Development?* (Vol. 15). Dunfermline: Carnegie UK Trust.

Smith, L.C., and Frankenberger, T.R. 2018. "Does Resilience Capacity Reduce the Negative Impact of Shocks on Household Food Security? Evidence from the 2014 Floods in Northern Bangladesh." *World Development* 102: 358-376.

Speranza, C.I., Wiesmann, U., and Rist, S. 2014. "An Indicator Framework for Assessing Livelihood Resilience in the Context of Social–Ecological Dynamics." *Global Environmental Change* 28: 109-119.

Steiner, A. and Atterton, J. 2015. "Exploring the Contribution of Rural Enterprises to Local Resilience." *Journal of Rural Studies* 40: 30-45.

Vhurumuku, E. 2014. *Food Security Indicators*. Workshop/conference paper. FAO. Kenya: Nairobi.

Wei, H. and Lu, Q. 2020. "Impact of COVID-19 on Agriculture, Rural Areas, and Rural People and Counter Measures." *Economic Review Journal* 425: 36-45.

WHO (World Health Organization). 2020. *COVID-19 and Food Safety: Guidance for Food Businesses: Interim Guidance*, 07 April 2020 (No. WHO/2019-nCoV/Food Safety /2020.1).

Wodajo, H.D., Gemeda, B.A., Kinati, W., Mulem, A.A., van Eerdewijk, A., and Wieland, B. 2020. "Contribution of Small Ruminants to Food Security for Ethiopian Smallholder Farmers." *Small Ruminant Research* 184: 106064. https://doi.org/10.1016/j.smallrumres.2020.106064

World Bank and NBS. 2020. *COVID-19 Impact Monitoring, Nigeria*. Synthesis Report (April/May - Survey rounds 1) Abuja.

World Bank. 2018. *Investing in Human Capital in Nigeria's Future*. Country Focus, Nigeria. Washington, DC.

Yaro, J.A., 2013. *Building Resilience and Reducing Vulnerability to Climate Change: Implications for Food Security in Ghana*. Friedrich-Ebert-Stiftung, Ghana Office

Appendixes

Table A1. Food insecurity experience scale (FIES) questions and summary of 'Yes' responses

FIES questions	Percentage of 'Yes' responses	Of 'Yes' respondents (caused by COVID-19)
Q1. Was there a time that you **worried you would not have enough food** to eat because of a lack of money or resources?	76.66	69.57
Q2. Were you or a member of your household **unable to eat healthy and nutritious food** because of a lack of money or resources?	69.52	73.97
Q3.Was there a time when you or others in your household **ate only a few kinds of foods** because of a lack of money or other resources?	74.28	72.76
Q4.Was there a time when you or others in your household **had to skip a meal** because of a lack of money or resources?	69.52	75.32
Q5. Was there a time when you or others in your household **eat less than you thought you should** because of a lack of money or resources?	55.47	76.73
Q6. Was there a time when your household **ran out of food** because of a lack of money or other resources?	67.73	78.64
Q7. Was there a time when you or others in your household **were hungry but did not eat** because of lack money or resources?	53.21	73.29
Q8. Was there a time when you or others in your household **went without eating for a whole day** because of a lack of money or other resources?	12.26	73.99

Source: Authors' compilation from survey-II data (July 2021)

Table A2. Seven- day recall questions of consumption of food groups

Food group	In the last 7 days, have your household consumed *[Food Group]?* 1=Yes, 2=No	If 'Yes', how often have you consumed [food Group] in the last 7 days? 1= Rarely (1 time/week) 2= Sometimes (2-3 times/week 3= Often (4 or more times/week)
1. **Cereals and grains** (rice, maize, sorghum, millet…)		
2. **Tubers and roots** (cassava, yam, potatoes…)		
3. **Legumes/nuts/seeds** (beans, cowpeas, peanut, lentils, soya,...)		
4. **Dairy** products (milk, butter, yogurt, …)		
5. **Meat** (beef, goat meet, sheep meat…)		
6. **Eggs**		
7. **Fish** (shellfish, tuna, dried fish, …)		
8. **Oil/fat** (palm oil, vegetable oil, shea butter ….)		
9. **Vegetables** (onion, cabbage, tomatoes, carrots, pepper, pumpkin, spinach …)		
10. **Fruits** (banana, avocado, orange, papaya, mango….)		
11. **Sugar/sweet** (sugar, honey, jam, candy, Cookies, cakes….)		
12. **Condiments**, spicy (salt, garlic, tea, condiments, yeast,….)		

Source: Authors' compilation from survey-II data (July 2021)

Table A3. Coping strategies adopted in response to food price inflation

Type of coping strategy	**Percentage of households**
Sale of assets	20.45
Engaged in additional income generating activities	19.92
Received assistance from friends & family	6.33
Borrowed from friends & family	8.71
Took a loan from a financial institution	3.30
Credited purchases	10.69
Delayed payment obligations	1.72
Sold harvest in advance	5.41
Reduced food consumption	49.47
Reduced non-food consumption	33.77
Relied on savings	35.88
Received assistance from NGO	0.13
Took advanced payment from an employer	0.13
Received assistance from the government	0.40
Was covered by insurance policy	0.00
Did nothing	10.16

Source: Authors' compilation from survey-II data (July 2021)

Table A4. Non-farm income sources for the household

Non-farm income sources for household	Yes (%)	Changes in income from this source amid COVID-19 (% of respondents)		
		Increased	Same	Decreased
Non-farm family business	76.55	26.84	17.74	55.42
Wage employment	46.55	21.33	53.87	24.8
Remittance from abroad	2.74	16.67	38.89	44.44
Assistance family/friends within the country	38.69	10.22	14.96	74.82
Income from properties or investments	13.93	16.49	53.61	29.9
Pension	5.95	7.50	82.5	10.00
Assistance from government	6.67	11.36	25.00	63.64
Assistance form NGO/charitable organizations	2.98	43.75	6.25	50.0
Others	0.95	33.33	66.67	0.00

Source: Authors' compilation from survey-II data (July 2021)

Table A5. Questions on conflicts/local insecurity situation and farm activities

	Questions	**Response Category**
1	Have your household exposed to or experienced any security threats in the last 12 months? [1=Yes, 2=No]	1=Yes 2=No
2	If 'Yes' to I.1, compared to the situation before the corona virus in Nigeria (March 2020); how have such security threats changed?	1=Increased 2-Decreased 3=No change
3	If 'Yes' to I.1, what are the 3 most dominant security threats to your household or your local community?	1=Farmer-herder conflict 2=Robbery 3=Kidnapping 4=Banditry 5=Rustling of livestock 6=Others
4	How severely has the presence of these security threats affected your households' […….]? [for questions: 4.1- 4.4]	
4.1	----- access to agricultural input markets (i.e., acquiring inputs like fertilizers, seeds, tractors, etc.)?	1=Extremely severe 2=Moderately Severe 3=Slightly sever 4=Not at all
4.2	------access to market to sell your produce (harvested produce)?	1=Extremely severe 2=Moderately Severe 3=Slightly severe 4=Not at all
4.3	------farm operations (planting, ploughing, weeding, harvesting)?	1=Extremely severe 2=Moderately Severe 3=Slightly severe 4=Not at all
4.4	------expansion of your farm (e.g., cultivating more land; more livestock)?	1=Extremely severe 2=Moderately Severe 3=Slightly severe 4=Not at all
5	How have the security threats affected your household's non-farm business participation?	1=Increased 2=Decreased 3= No impact
6	How have food prices changed in your local areas due to the presence of security threats?	1=Increased 2=Decreased 3=No impact
7	Has the insecurity threat affected access to schools, religious centers, health centers etc.?	1=Yes 2=No
8	Has the insecurity threat affected your psychological wellbeing (anxiety, fear,..)?	1=Yes 2=No

Source: Authors' compilation from survey-II data (July 2021)

ALL IFPRI DISCUSSION PAPERS

All discussion papers are available **here**

They can be downloaded free of charge

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
www.ifpri.org

IFPRI HEADQUARTERS
1201 Eye Street, NW
Washington, DC 20005 USA
Tel.: +1-202-862-5600
Fax: +1-202-862-5606
Email: ifpri@cgiar.org

NIGERIA OFFICE
6 Ogbagi Street, Plot 1413
Off Oro-Ago Crescent, Garki II
Abuja
Nigeria
Phone: +234 092912092
Email: IFPRI-Nigeria@cgiar.org
nssp.ifpri.info